MONTHLY REPORT

CONTRACT [redacted]

25X1

PAR 217

30 Oct 64

SUBJECT: Optimization of Lasers

TASK/PROBLEM

1. Explore the production of 0.53 micron (blue-green) laser radiation by harmonic doubling in KDP and ADP crystals.

DISCUSSION

2. Our laboratory setup is now capable of producing over 4 watts of second harmonic 0.53 radiation in a one millisecond pulse. If we illuminate a one square cm spot with this laser-crystal radiation, the illuminance (visual response) produced is about 200X that produced by the sun upon the earth's surface. The ratio of irradiance (total energy) is different (about 30:1) since the laser-crystal output is all near the peak of visual response and the solar output covers a wide range of wavelength.

3. During this period, we have photographed this second harmonic beam incident on several diffuse surfaces. In every exposure, the beam has displayed a lattice work or basket weave structure. In addition to this structure, there has been a considerable variation in the exposure density.

4. Also during this period, spectrographic measurements of the harmonic beam have been made. The results show the spectral band width of beam to be approximately 30 Angstroms.

5. We have photographed both the fundamental 1.06 micron beam and the second harmonic 0.53 micron beam with an extended range color film. Thus far, we have determined that the 1.06 micron energy does expose the film, the fundamental and second harmonic beams are refracted at slightly different angles by the crystal, and the fundamental and second harmonic beam sizes are comparable.

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PLANNED ACTIVITY

6. During the next period and possibly in several to follow, effort will be concentrated on the second harmonic beam structure. The initial steps will involve determining the fundamental 1.06 micron beam structure using the infrared sensitive film. Comparative measurements will then be made between this structure and that of the second harmonic. The primary goal in this phase of the program will be to determine where and how this beam structure originates and to eliminate or reduce it to a point where it offers promise as an illuminator for a photographic reproduction system.

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